

PROGRAM facts

U.S. DEPARTMENT OF ENERGY
NATIONAL ENERGY TECHNOLOGY LABORATORY

Power Systems Advanced Research

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BIOPROCESSING / BIOTECHNOLOGY

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NETL WEBSITE

www.netl.doe.gov

The mission of the Advanced Research Program is to serve as the bridge between basic and applied research and to ensure the development and deployment of innovative systems for improving the efficiency and environmental performance of advanced fossil energy systems at reduced costs.

As we enter the 21st century, the nation's economic progress will depend on continued advances in fossil energy science and engineering. The challenge for the Advanced Research Program is to extend the understanding of energy science and engineering to energy security. Electricity deregulation, stringent environmental regulations, and requirements to control carbon dioxide and other greenhouse gases, will drive the need for advanced biological processes.

Description

This Bioprocessing/Biotechnology Program sponsors basic science and research related to fossil fuel use in the areas of biology, biochemistry, microbiology, and bioengineering. The Program focuses on bioprocesses that foster:

- (1) innovative uses for coal combustion byproducts;
- (2) development of alternative fuels; and
- (3) identification of biomass sources.



The Program continues to focus on mitigating the environmental impacts from mining and use of fossil fuels, addressing environmental issues that affect the power industry, and developing biological greenhouse gas sequestration technologies.



BIOPROCESSING / BIOTECHNOLOGY

Goals

- Find new and innovative uses for coal byproducts (fly ash, bottom ash, off gases, coal fines).
- Develop new and innovative uses for coal other than combustion.
- Develop new biological sources of alternative fuels, such as hydrogen and methane.
- Cofire coal with other materials (noxious plants, waste plant products, and other biofuels).
- Mitigate greenhouse gas emissions by recycling off gases.
- Develop ways to sequester greenhouse gases in recyclable biomass.
- Provide a relatively stable “sink” for greenhouse gases (stable for ~100 years; i.e., growing trees for lumber).
- Address environmental issues affecting the power industry, such as bodies of water being heated by once-through cooling water discharges and cooling water intakes being fouled by invasive mussels.
- Address mining issues, such as acid mine drainage and reclamation of strip-mined lands.

Program Accomplishments

- Expansion of the program in scope and number of participants.
- CO₂ sequestration using microorganisms.
- H₂ production from biomass waste products.
- Biological removal of trace metals from soil and water.
- Environmentally friendly and cost-effective chemical production.
- Biological control of organisms harmful to power plants.
- Highly successful First Annual Bioprocessing Conference.
- Creation of a prototype system for high production of H₂ gas from waste biomass using extremophilic microorganisms (NETL).
- Began work to produce adipic acid (a major component of nylon production) with organically soluble bioenzymes to reduce NO_x production (INEEL).

PROGRAM PARTICIPANTS

Idaho National Engineering and Environmental Laboratory (INEEL),
Idaho Falls, Idaho

Oak Ridge National Laboratory (ORNL),
Oak Ridge, Tennessee

Pacific Northwest National Laboratory (PNNL),
Richland, Washington

University Of North Dakota Energy & Environmental Research Center (UNDEERC),
Grand Forks, North Dakota

Little Bear Laboratories,
Golden, Colorado

University of South Carolina,
Aiken, South Carolina

University of North Carolina,
Chapel Hill, North Carolina

Ohio University,
Athens, Ohio

NOVA Southeastern University, Dania, Florida

US Geological Survey, St. Petersburg, Florida

West Virginia University,
Morgantown, West Virginia

New York State Museum,
Albany, New York

San Francisco Estuary Institute,
Richmond, California

Center for Bioenvironmental Research at Tulane and Xavier Universities,
New Orleans, Louisiana

